



Converged Fabric Adapter

Gen 5 FC, Advanced-8™ FC, 10GbE FCoE

LightPulse® LPe16202-X



Simplified Networking, Maximum Performance and Increased Business Agility

The Emulex LPe16202-X Converged Fabric Adapter (CFA) is a new class of adapter that provides the flexibility to run Gen 5 FC (16Gb), Advanced-8 (8Gb) Fibre Channel, or 10GbE Fibre Channel over Ethernet (FCoE) connectivity with one adapter—meeting today's and tomorrow's connectivity needs while preserving IT investments.

Changing fabric personalities is seamless via plug-and-play detection of SFP+ optical transceivers (SFP+ modules are purchased separately). Depending on which optical transceiver is installed, the CFA will intelligently know to run in FC or FCoE mode. In an Ethernet environment, the adapter provides full Ethernet (NIC) connectivity concurrently with FCoE. The LPe16202-X also supports direct attach copper (DAC) for 10GbE connectivity.

The ultimate converged solution for enterprise data centers and service providers

For enterprise data centers and service providers using FC today, this new CFA provides an easy FCoE upgrade in the future without having to rip and replace adapters and drivers. Additionally, data centers running both FC and FCoE storage systems, will benefit from standardizing on one adapter, simplifying their qualification process and spares inventory.

On-the-fly configuration for OEMs, systems integrators and appliance vendors

For OEMs, system integrators, and appliance vendors, this CFA enables one adapter to be qualified, inventoried and configured at the time of shipment as an adapter running at 16GFC or 8GFC, or 10GbE FCoE based simply on the optics plugged into the card. Additionally, Emulex's OneCore™ Storage Software Development Kit (SDK), provides simplified driver and support to accelerate the process of developing storage solutions to meet the dynamic needs of the storage array, and storage appliance markets that require enterprise-class, high bandwidth and low latency I/O connectivity. The OneCore Storage driver architecture provides design flexibility, enabling selective use of component layers to meet customer-specific requirements and architectural needs.

Key benefits

- Multi-function CFA—selectable Gen 5 FC or Advanced-8 Fibre Channel and 10GbE FCoE personalities for future-proofed data centers and private clouds
- Simplified and time-saving diagnostics of storage network connectivity by using Brocade ClearLink supported Switches and Emulex HBAs
- Ability to meet SLAs and ensure Quality of Service for prioritized traffic with ExpressLane™
- Maximum performance—up to 1.2 million IOPS on a single-port to support larger server virtualization deployments and scalable cloud initiatives, as well as performance to match new multi-core processors, solid state disks (SSDs) and faster PCI Express (PCIe) 3.0 server host bus architectures
- Improves IT staff productivity through simplified deployment and management
- Reduces the number of cards, cables and PCIe slots required
- Exceptional performance per watt and price/performance ratios
- Integrates seamlessly into existing SANs
- Allows application of SAN best practices, tools and processes with virtual server deployments
- Assures data availability and data integrity



LightPulse® LPe16202-X

At 1.2 million I/O operations per second (IOPS) on a single-port, it is the fastest FC adapter available, making it ideal for connectivity from multi-core servers to cache-rich enterprise arrays, SSDs, flash-based storage and big data appliances. It is also the only adapter with T10 Protection Information (T10 PI) offload—advanced data integrity that safeguards data from silent data corruption. Its advanced management functionality can shave days off installing and managing adapters. The LPe16202-X CFA features the Emulex bullet-proof driver-stack and backward compatibility to 8GFC, 4GFC and 2GFC HBAs.* The enterprise-class design delivers up to ten times better reliability than other 16GFC adapters.**

Emulex is trusted by data centers the world-over, with more than 12 million HBA ports shipped and installed to date with a heritage that spans back to the first generation of FC to today's Gen 5 FC adapters.

Proven design, architecture and interface

The Emulex LightPulse highly integrated multi-core processor design maximizes host performance and efficiency. Advanced error-checking features ensure the integrity of block data as it traverses the storage area network (SAN). Emulex's firmware based architecture enables feature and performance upgrades without costly hardware changes.

The unique 4th Generation Service Level Interface (SLI™) allows use of a common driver across all models of Emulex CFAs, CNAs, and HBAs on a given operating system (OS) platform. Installation and management facilities are designed to minimize server reboots and further simplify deployment.

Powerful management software for maximum data center efficiency

The Emulex OneCommand® Manager enterprise-class management application features a multiprotocol, cross-platform architecture that provides centralized management of all adapters provided by Emulex. This enables IT administrators to manage network connectivity with one tool for maximum efficiency. OneCommand Manager also features:

- **OneCommand® Manager plug-in for VMware vCenter Server**—Enables comprehensive control of Fibre Channel HBAs and network (FCoE, iSCSI and TCP/IP NIC) connectivity solutions provided by Emulex from VMware's vCenter Server management console. Emulex OneCommand Manager plug-in for VMware vCenter Server supports both the new VMware vSphere 5.1 Web Client and the VMware vCenter Server desktop client with an identical feature set regardless of the client.

Key features

- PCIe 3.0 bus (PCIe 2.0 compatible)
- Streamlined personality changes with smart detection of SFP+ optical transceivers
- vScale™ performance and scalability—multicore ASIC engine with eight cores supports 255 virtual functions (VFs), 1024 Message Signaled Interrupts eXtended (MSI-X) and 8192 logins/open exchanges for maximum virtual machine (VM) density—up to four times more than other adapters supporting Gen 5 FC
- Twice the management functionality, and takes half the time to manage with OneCommand® Manager
- GreenState™ power efficiency—reduces data center power consumption and associated OPEX by delivering up to four times better IOPS performance/watt
- Data integrity offload—high performance T10 PI end-to-end data integrity protects against silent data corruption without the 30 percent performance penalty of firmware-based T10 PI
- vEngine™ CPU offload—lowers CPU burden on host server, enabling support for more VMs
- Rock-solid reliability and thermal characteristics ensures SLAs are met in mission-critical, cloud and virtualized environments
- Support for MSI-X, improves host utilization and enhances application performance
- Auto-negotiated 16GFC, 8GFC and 4GFC (with Gen 5 16GFC optics) and auto-negotiated 8GFC, 4GFC and 2GFC (with 8GFC optics) when in FC mode
- Comprehensive virtualization capabilities with support for N_Port ID Virtualization (NPIV) in Solaris and other operating environments
- Common driver model, allows a single driver to support all Emulex HBAs on a given OS
- Secure management with role-based administration integrated with Light Directory Access Protocol (LDAP) and Active Directory (AD) services

Standards

General specifications

- The LPe16202-X CFA is powered by the Emulex XE201 converged fabric controller which is capable of running FC and Ethernet and consists of an eight-lane (x8) PCIe 3.0 bus (backward compatibility to PCIe 2.0 supported)

Architecture

- Supports up to two FC ports at 16GFC or 8GFC, or two 10GbE FCoE ports
- Dual-port 16GFC optics supports 16GFC, 8GFC and 4GFC link speeds, automatically negotiated (optics purchased separately)
- Dual-port 8GFC optics* supports 8GFC, 4GFC and 2GFC link speeds, automatically negotiated (optics purchased separately)

Ethernet / NIC feature support

(driver support varies by operating system)

- Jumbo frames support for frame sizes of at least 9 Kbytes
- Hardware TCP/UDP checksum generation
- Hardware IPv4/IPv6 checksum offload
- Hardware Large Segmentation Offload
- Hardware Header and Data Split
- Full duplex operation is supported
- Up to 128 MAC addresses
- Unicast/Multi-cast address filtering
- VMware Netqueue
- Packet Filtering based on MAC address or VLAN tag
- Microsoft Receive Side Scaling (RSS)
- NIC Teaming (NOTE: Enabled via host-side drivers)
- PCI hotplug
- PXE Boot
- FCode
- Priority Flow Control 802.1Qbb Ver 0
- DCB Exchange Protocol (DCBX) Ver 1.01
- Enhanced Transmission Selection 802.1Qaz Ver 0
- T11 FCoE Initialization Protocol (FIP) Rev.2.0, T11/09-056v5

Fibre Channel / FCoE standards

- Topologies supported include FC-SW switched fabric (N_Port), Point-to-point (N_Port) and FC-AL Arbitrated Loop (NL_Port) – on 2GFC/4GFC/8GFC speeds
- Dual port FC Over Ethernet
- FC & FCoE Compatible with:
- Fibre Channel Physical and Signaling (FC-PH, FC-PH2, FC-PH3)
- Fibre Channel Arbitrated Loop (FC-AL-2) – on 2GFC/4GFC/8GFC speeds
- Fibre Channel Generic Services (FC-GS-3)
- Fibre Channel Framing and Signaling (FC-FS)
- Fibre Channel Physical Interface (FC-PI)
- Fibre Channel Tape and Medium Changers (FC-Tape)
- Fibre Channel Switch Fabric (FC-SW-4)
- Fibre Channel Protocol for SCSI Support (FC-FCP, FC-FCP2, FCP-3-SCSI)
- FMA support
- T10 DIF or T10 PI native support
- Fibre Channel interface compliant with appropriate T11.org specifications
- Fibre Channel General Services (FC-GS, FC-GS-2, FC-GS-3)

PCI specifications

- PCI Express Base Specification 3.0
- PCI Express Card Electromechanical Specification (CEM) 2.0
- PCI Express Module Electromechanical Specification 1.0
- BIOS Boot Specification Version 1.01 (Compaq Computer, Phoenix Technologies, Intel)
- IEEE Std 1275-1994 IEEE Standard for Boot (Initialization Configuration) Firmware: Core Requirements and Practices (OpenBoot standard)
- PCI Express Base Specification Rev. 2.1
- PCI Express Card Electromechanical Specification Rev. 2.0
- PCI Local Bus Specification Rev. 3.0
- PCI Bus Power Management Interface Specification Rev. 1.2
- PCI Hot-Plug Specification Rev. 1.1
- PCI-to-PCI Bridge Architecture Specification Rev. 1.2
- PCI Express to PCI/PCIX Bridge Specification Rev 1.0
- PCI-SIG Single Root I/O Virtualization and Sharing Specification Rev. 1.1
- SFF 8431- SFP+ PCIe Specifications

Data integrity

- Supports T10 PI / Data Integrity Field (T10 DIF) standard per T10 working group with high performance offload
 - Simultaneous 512-Byte and 520-Byte block support
 - Simultaneous 4096-Byte and 4104-Byte block support
 - DIF Error Reporting
- End-to-End CRC (ECRC) support per PCIe 3.0 specification
- GMAC support

Ethernet and NIC standards

- IEEE 802.1Q VLAN
- IEEE 802.1P and 802.1D
- IEEE 802.3x
- IEEE 802.1Qbb
- IEEE 802.1Qaz
- IEEE 802.3ab/802.3z
- DCBX

Comprehensive OS and hypervisor support

- Windows Server
- Linux
- Solaris
- VMware vSphere
- Windows Hyper-V
- Additional support is available from OEMs and partners

Hardware environments

- SPARC and x86/64

Optical

- Fibre Channel data rates: 14.025 Gb/s (1600Mb/s); 8.5 Gb/s (800Mb/s); 4.25 Gb/s (400 Mb/s) (auto-detected)
 - Ethernet data rates: 10.3125 Gb/s, full-duplex line rate
- Optics: Short wave lasers with LC type connector
- Cable: Operating at 16Gb
 - 15m at 16Gb on 62.5/125 µm OM1 Multi-Mode Fibre (MMF)
 - 35m at 16Gb on 50/125 µm OM2 MMF
 - 100m at 16Gb on 50/125 µm OM3 MMF
 - 125m at 16Gb on 50/125 µm OM4 MMF
- Cable: Operating at 10GbE (for 850 nm wavelength multi-mode cables; 1300 nm wavelength cables can support longer distances)
 - 33m at 10Gb on 62.5/125 µm OM1 MMF
 - 82m at 10Gb on 50/125 µm OM2 MMF
 - up to 300m at 10Gb on 50/125 µm OM3 MMF
 - up to 400m at 10Gb on 50/125 µm OM4 MMF

Physical dimensions

- Short, low profile MD2 form factor card
- 167.64mm x 68.91mm (6.60" x 2.71")
- Low profile bracket
- Standard bracket ships in the box

Power and environmental requirements

Power supply 1.8V, 1.2V, 0.9V

- Volts: +3.3, +12
- Operating temperature: 0° to 58° C (32° to 131° F)
- Storage temperature: -43° to 73° C (-40° to 158° F)
- Humidity:
 - Operating: 10 percent to 90 percent RH, non-condensing, 27°C max wet bulb
 - Non-operating: 93 percent RH, non-condensing, 38°C max wet bulb

Altitude

- Operating: 3000m, Non-operating: 12,000m

Vibration

- Operating: 0.20G in all axes, 5-500 Hz sine
- Non-operating: 1.0G in all axes, 5-500 Hz sine

Shock

- Operating: 5G, 11 ms half-sine
- Non-operating: 30G 11 ms half-sine

Agency and safety approvals

North America

- FCC Class A
- UL/CSA Recognized

Europe

- CE Mark
- EU RoHS compliant
- TUV Bauart Certified

Japan

- VCCI Class A

Taiwan

- BSMI Class A

Korea

- MSIP (formally KCC/MIC) Class A

China

- China RoHS Compliant

(Please refer to the product page on www.emulex.com for further details)

Boot support

x86 (Solaris, RHEL, SLES, OEL, Oracle VM, ESX/ESXi, Windows Server)

- FC Boot
- PXE Boot
- iBFT Software iSCSI Boot
- FCoE Boot

UEFI (for Intel E5 2600 based servers)

- FC Boot
- NIC PXE Boot
- iBFT SW iSCSI Boot
- FCoE Boot

Solaris SparcFC FCode

- NIC FCode
- iSCSI not required (built into OBP)
- FCoE FCode

Ordering information

The LPe16202-X CFA is available from Emulex.

To order, use the following part numbers:

- An optics kit must be purchased along with the adapter on the same purchase order, unless using DAC (Direct Attach Copper). Use of non-Emulex optics kits voids warranty.
- LPe16202-X - Dual-port low-profile CFA base adapter is configurable as two FC ports at Gen 5 16GFC or 8GFC; or two FCoE ports at 10GbE with the purchase of optics kits.
- The CFA also supports direct attach copper (DAC) cabling for 10GbE FCoE connectivity.
- Standard bracket installed on card, low-profile bracket ships in box.
- Optics sold separately, see options below

Options (orderable separately)

2 external SFP+ plug-able modules:

- LPe16100-OPTx2
SFP+ Optical modules (16Gbps, short wave)
- LPe12100-OPTx2
SFP+ Optical modules (8Gbps, short wave)*
- OCe10100-OPT
Optical modules (10GbE FCoE)

Added features

Performance features

- Doubling the maximum FC link rate from 8GFC to 16GFC and enhanced virtualization capabilities, helps support IT "green" initiatives.
- Frame-level multiplexing and out-of-order frame reassembly increases link efficiency and maximizes HBA performance.

Data protection features

- End-to-end data protection with hardware parity, CRC, ECC and other advanced error checking and correcting algorithms ensure data is safe from corruption.
- Enhanced silent data corruption protection provided by T10 PI with high performance offload.

Deployment and management features

- Universal boot capability allows the appropriate boot environment to be automatically selected for any given hardware.
- Boot from SAN capability reduces system management costs and increases uptime.
- Detailed, real-time event logging and tracing enables quick diagnosis of SAN problems.
- Beaconing feature flashes the HBA LEDs, simplifying their identification within server racks.
- Environmental monitoring feature helps optimize SAN availability.

Management features

- The Emulex OneCommand Manager application enables centralized discovery, monitoring, reporting, and administration of adapters provided by Emulex on local and remote hosts. Powerful automation capabilities facilitate remote driver parameter, firmware and boot code upgrades.
- Advanced diagnostic features, such as adapter port beaconing and adapter statistics, help optimize management and network performance, while the environmental monitoring feature helps to maintain optimum host-to-fabric connections. In addition to the GUI interface, management functions can also be performed via a scriptable Command Line Interface (CLI) as well as a web browser.
- OneCommand Manager supports role-based management to facilitate administration of adapters throughout the data center without compromising security. Management privileges can be assigned based on LDAP and AD group memberships.
- Emulex's management instrumentation complies to open management standards, such as SMI-S and common HBA API support, which enables seamless upward integration into enterprise storage and server management solutions.
- Unsurpassed reliability and simplified diagnostics of storage network connectivity with Brocade ClearLink on Switches.
- Meet SLAs and QoS with ExpressLane™ application prioritization on hosts. ExpressLane is fully compatible with majority switches offering QoS features.
- Driver and devices fully integrated and operating with Oracle Solaris management (FMA, DTrace) as well as Oracle VM for SPARC and Oracle VM for x86

* 8GFC optic kits available Q1, 2014. Backward compatibility to 2GFC supported with 8GFC optics.

** Emulex Reliability Study (2013).



World Headquarters 3333 Susan Street, Costa Mesa, CA 92626 +1 714 662 5600

Bangalore, India +91 80 40156789 | Beijing, China +86 10 84400221

Dublin, Ireland +35 3 (0) 1 652 1700 | Munich, Germany +49 (0) 89 97007 177

Paris, France +33 (0) 158 580 022 | Tokyo, Japan +81 3 5325 3261 | Singapore +65 6866 3768

Wokingham, United Kingdom +44 (0) 118 977 2929 | Brazil +55 11 3443 7735

www.emulex.com